



# Methodology of problematization with the maguerez's arch: an alternative method for teaching, research and study in dentistry

Metodologia da problematização com o Arco de Maguerez: um método complementar para a educação em odontologia.

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## ABSTRACT

**Objective:** evaluate the application of the problematization methodology (PM), Maguerez's Arch, as an alternative teaching-learning method in the formation of post-graduation students. **Material and Methods:** 25 post-graduate students of the program in Restorative Dentistry at the Instituto de Ciência e Tecnologia da Universidade Estadual Paulista "Júlio Mesquita Filho"– UNESP, who were part of the discipline of Didactics Applied to Higher Education in Healthcare, developed activities that characterized the PM, and the traditional teaching methodology in force. By means of a questionnaire it was possible to assess the perception of the students had of the activities. **Result:** It was observed that PM was a valid alternative teaching-learning method for the formation of new professors; For all the students, they were sufficiently encouraged to develop a critical thinking about the situations addressed; 96% of the students believe that the PM is coherent for the formation of future professors and provides a learning model for a continuous professional development; However, 44% and 32% of the students respectively, believed that the professors are not prepared to work in multidisciplinary teams, as stated by the ,PM and that the professors are not inclined to change their didactic methods. **Conclusion:** PM, based on Maquerez's Arch can be applied as a complementary tool in the construction of the future professors' knowledge, in addition to being a strategy for research and study.

## KEYWORDS

Dental education; Educational activities; Learning; Teaching.

## RESUMO

**Objetivo:** avaliar a aplicação da metodologia de problematização (MP), o Arco de Maguerez, como um método de ensino-aprendizagem na formação de estudantes de pós-graduação. **Material e Métodos:** 25 alunos de pós-graduação do programa em Dentística Restauradora do Instituto de Ciência e Tecnologia da Universidade Estadual Paulista "Júlio Mesquita Filho" - UNESP, que faziam parte da disciplina de Didática Aplicada ao Ensino Superior em Saúde, desenvolveram atividades que caracterizaram a MP, e a metodologia de ensino tradicional em vigor. Por meio de um questionário, foi possível avaliar a percepção que os alunos tinham das atividades. **Resultados:** Verificou-se que a MP foi um método de ensino-aprendizagem válido para a formação de novos professores; Para todos os estudantes, eles foram suficientemente encorajados a desenvolver um pensamento crítico sobre as situações abordadas; 96% dos estudantes acreditam que a PM é coerente para a formação de futuros professores e fornece um modelo de aprendizagem para um desenvolvimento profissional contínuo; No entanto, 44% e 32% dos estudantes, respectivamente, acreditam que os professores não estão preparados para trabalhar em equipes multidisciplinares, como afirmado pelo MP e que os professores não estão dispostos a mudar seus métodos didáticos. **Conclusão:** MP, com base no Arco de Maquerez pode ser aplicado como uma ferramenta complementar na construção do conhecimento dos futuros professores, além de ser uma estratégia para pesquisa e estudo.

## PALAVRAS-CHAVE

Educação em odontologia; Atividades de ensino; Aprendizagem; Ensino.

## INTRODUCTION

Education is always presented as the basis for both formation and evolution of the society, with the individuals being a reflection of their education. We can observe the marking characteristics of each time in the principles and methods, since these are inserted in the processes of cultural change and evolution.

Even in our daily life, we have to adapt ourselves to the new situations and problems emerging every day, thus learning continuously. [1] In view of this, educational institutions follow the changes occurred in order to avoid configuration of people with ideas and concepts far from the reality in which they live.

This could not be different in the higher-education institutions (HEIs) different as they are accounted for the formation of professionals who will need to cope directly or indirectly with the reality in which they are contextualised.

In Brazil, the teaching of dentistry is guided by a technical model developed in 1919 and which no longer meets the needs of the today's reality. [2] This teaching model was shown to be poorly efficient with the establishment of the Unique Health System (SUS), since the traditional dentist is focused on performing clinical care (curative) rather than attending to the patient as a whole. [2,3]

In view of the social demands and implementation of the so-called educational laws, it was necessary to review the quality of the teaching-learning strategies. With the implementation of the National Education Policy Act (LDB) in 1996, the Brazilian Ministry of Education has been promoting discussions on the formation of professionals from different areas, culminating into national curriculum policies (NCPs), which should be followed by the HEIs. [4]

These institutions are being encouraged to adapt themselves to a teaching methodology

that values equality, quality and efficacy of the service, and importance of the healthcare work. Therefore, challenging changes have been occurring, [5] and it is also becoming clear the importance of stimulating new studies on the education and always relying on the participation of both, students and faculty. Perhaps, the greatest challenge is to convince the institutional leaders about the importance of carrying out studies that lead to the improvement of the teaching quality and consequently to a better formation of the future professionals. [6]

The PM has emerged as an alternative method for teaching, research and study. Its model was elaborated in the 1960's by Paulo Freire, a Brazilian educator who enthusiastically supported this methodology. [7] One of the PM tools is the Magueres's Arch method, which was made public by Bordenave & Pereira in 1982 and became the main reference for this method. The "Method of Arch" proposed by Charles Magueres is addressed by the above-mentioned authors in their book "Strategies for Teaching and Learning". For Bordenave & Pereira, the "Method of Arch" is a possible and alternative way towards a problematizing education in HEIs. The conception points to a libertarian education because it is supposed to guide the pedagogical practice of educators who are concerned with the development and intellectual autonomy of their students, including critical and creative thinking, which can lead to a social transformation as the students can influence the reality within which they are. [8] The Magueres's Arch comprises five steps developed from the reality, or a cross-section of it, as follows: 1) Observation of Reality; 2) Key-points; 3) Theorisation; 4) Hypotheses of Solution; and 5) Application to Reality (practice). [9,10]

This methodology is aimed at promoting liberation and emancipation of the learners from their educational oppressors. When applied to the academic area of healthcare, the objective is to form socially-contextualised and instrumented professionals to face the

population's health problems. Also, the professional profile is transformed as it becomes more critical to the teaching content, articulating the academic milieu in relation to the world of practice and applying the knowledge according to the community's needs. [7,10]

In view of the changes occurring in the country's educational reality, the conceptions on the formation of professors have also been changing over the years. The notion that the professor has to convey information and the students have to receive them passively no longer matches the reality of the current teaching process. It is necessary that the professor be competent and inserted in both work market and society by demonstrating high-level education and making use of information technologies in their work. [11,12] Need to be engaged in their work and have good ability to motivate and inspire their students. [13]

The PM with the Maguerez's Arch is of extreme relevance in the process of building and developing the knowledge, since the professors who use this approach in their studies or teaching/research for formation of new professionals are encouraged to broaden their knowledge by transforming themselves and seeking to transform the reality regarding necessary aspects. [12]

Therefore, this research was aimed at assessing the feasibility of the application of the PM by using the Maguerez's Arch as an alternative teaching and learning method for formation of post-graduate students.

## **MATERIAL & METHODS**

After approval of the ethics research committee of the Instituto de Ciência e Tecnologia da Universidade Estadual Paulista "Júlio Mesquita Filho"– UNESP, nº 032/2011-PH/CEP, the present study was begun as follows:

The study was conducted with 25 master and doctoral post-graduate students from the program in Restorative Dentistry at the Instituto

de Ciência e Tecnologia da Universidade Estadual Paulista "Júlio Mesquita Filho" - UNESP. These students were participating in the discipline of Didactics Applied to Higher Education in Healthcare, where the activities related to the study were conducted. Of the 25 students participating in the study, 7 were from the area of dentistry, 6 from the area of endodontics and 12 from the area of dental prosthesis; being 22 females and 3 males, aged between 22 and 56 years (with more prevalent age from 22 to 29 years, with one participant with 33 years, one with 36 years and one with 56 years); 2 students did graduation in private institution and 17 in public institution. Only one participant had done a master degree in the area of mechanical engineering earlier. Of the 25 participants, 6 did not reported the age, the institution that attended the graduation and if have or not another graduate degree. These students were separate in two groups: dentistry and endodontics (Group 1 - 13 participants) and dental prosthesis (Group 2 - 12 participants). Where 72% of the students did not know the problematization methodology before participating in this study.

Two themes were initially selected that should be in the curriculum and in the daily life of the future professor in dentistry. These themes would be used for exposition of the teaching-learning methodologies proposed by the discipline of didactics applied to higher education in healthcare of the post-graduate program in restorative dentistry. After selecting the themes, two problematic facts (problems) related to the teaching and curricular realities were formulated and then assigned to each group for possible solutions before being presented to the students for analysis. It is worth pointing out that the problems were raised from the core of the classrooms under orientation of professors, who played a guiding role.

After assessing the supposedly solved problems, the groups presented the solutions to the classroom by means of two methodologies:

the traditional and the PM, respectively. Firstly, the classroom was shown a script describing how the presentation should be performed on the basis of the traditional teaching methodology that is currently applied to the dental school, where knowledge is conveyed on an exposition basis by means of images and texts on PowerPoint slides.

Next, they exposed the same theme (problem) on the basis of the PM where the Maguerez's Arch method was applied according to the following five steps in order to better assimilate the content: Observation of reality, Key-points, Theorisation, Hypotheses of solution, and Application to reality.

Thus, the Maguerez's Arch is completed so that the students can exercise the dialectic chain of action-reflection-action, or in other words, the relationship practice-theory-practice, with social reality being the start and the end of the teaching-learning process.

At the same time in which the applications of the teaching-learning methodologies were presented, a questionnaire was elaborated in order to assess the degree of significance and/or perception of the content presented by the students, according to two didactic views. The questionnaire was made based on previous studies done by researchers (Pilot Test). Next, it was observed the view of the participants when they played the teaching role, as well as their perceptions as spectators (students). The questionnaire was elaborated and then given to the students, who had to complete it before the end of the activities without having to identify themselves. After the traditional and active approaches, the hypothesis to be considered is that the students would be able to answer the questionnaire for evaluation of the present study.

After receiving the questionnaires, the answers were assessed by using the relative frequency analysis (percentage) and then we could observe the results regarding the application of both teaching-learning methodologies, allowing us to assess the strengths and weaknesses of the

PM based on Maguerez's Arch. The aim of this investigation was to assess qualitatively how much this active approach could contribute as a source of information and action for formation of human resources in the didactic-pedagogical context of the discipline of didactics applied to higher education in the post-graduate program at the Instituto de Ciência e Tecnologia da Universidade Estadual Paulista "Júlio Mesquita Filho" – UNESP.

## RESULTS

Initially, it is important to emphasize that all the 25(100%) students attending the discipline and participating in the present study completed the questionnaire.

### *Evaluation of the Professor's Performance and Functioning of the Discipline*

It is important to point out the following findings see (Table 1):

- 72% of the students did not know the PM, before this study;
- 80% of the students reported that they had good participation in the activities developed with the application of the PM;
- For all the students, the problematization problem uses time efficiently; and
- For all the students, they were sufficiently encouraged to develop a critical thinking about the situations addressed.

### *Evaluation of the Perception of the Problematization Methodology (Maguerez's Arch)*

Such data are listed in (Table 2), showing the most important commentaries:

- For all the students, the PM enables interaction with other disciplines;
- For all the students, the PM can also be used in dentistry as the way it is applied to other courses;
- About 96 % of the students reported that the PM favour the necessary interaction

**Table 1** - Evaluation of the professor's performance and the functioning of the discipline according to the participant's view

EVALUATION OF THE PROFESSOR AND FUNCTIONING OF THE DISCIPLINE	YES	NO
Did you know the PM as a teaching-learning approach?	28%	72%
Do you think that you had a good performance during application of PM?	96%	4%
Was the time spent for learning and training the contents through PM enough?	80%	20%
Was the available literature enough to study, explain and assess the PM?	84%	16%
Did the content organised by PM facilitate your comprehension?	96%	4%
Do you know to cope with the other's difference?	100%	0%
Does PM allow the practice of knowledge to cope with the other's difference?	86%	12%
Does PM use time efficiently, and the time spent was worth the effort?	100%	0%
Was there encouragement to form critical thinking on the situations addressed?	100%	0%

Source: Questionnaire completed by the participants in the study.

between theory and practice, which is very important in the dentistry graduation;

- About 80 % of the students reported that the PM assess different competencies in a group of students and it aimed at that either;
- For all the students, the PM encourages the autonomous and self-reflective learning, and;
- The PM provides a learning model for a continuous professional development for about 96% of the students.

#### *Evaluation of the Professor's Role*

In this context, the majority of the students (96%) believe that the PM is coherent for the formation of future professors, as shown in (Table 3). Also, the following findings are highlighted:

**Table 2** - Evaluation of the perception of the problematization methodology (Maguerez's arch) by the students

EVALUATION OF THE PERCEPTION OF THE PROBLEMATIZATION METHODOLOGY	YES	NO
Do you think the PM favour the teaching-learning process more than the verbal explanation?	96%	4%
Does PM enable opportunities for interaction with other disciplines?	100%	0%
Was there re-orientation about any mistake committed in the evaluation of the teaching-learning process by using the PM?	68%	32%
Was there any relationship between content addressed and other already known contents?	96%	4%
Does the interaction between professor and student favour the teaching-learning process practiced during application of the PM?	94%	6%
Can the PM being applied to other courses be also used in dentistry?	100%	0%
Does PM open space for dialogue between professor and student in the search for better ways towards the development of competencies?	100%	0%
Is there any conflict between PM and the traditional methods and approaches regarding the teaching-learning process?	52%	48%
In your opinion, are the group activities indispensable for the problematizing approaches?	99%	1%
Can the problem resolutions using the Maguerez's arch be used as study method?	100%	0%
Does PM enable a continuous and gradual study strategy?	100%	0%
Can PM assess different competencies within a group of students or not?	80%	20%
Does PM encourage the autonomous and self-reflective learning?	100%	0%
Does PM provide a learning model for a continuous professional development?	96%	4%
In your evaluation of the PM, do you believe that it is positive?	97%	3%

Source: Questionnaire completed by the participants in the study.

- 60% of the participants believe that the PM enables constant and gradual contact with both professional and dental realities;

- For all the students, the PM can be used for the new profile conceived for the professor;
- For 44% of the students, the professors are not prepared to work in multidisciplinary teams, as stated by the PM and;
- According to the students, 32% of the professors are not inclined to change their didactic methods.

## DISCUSSION

Educating is not only conveying and/or acquiring knowledge nor it represents a finished phenomenon, but it is inserted in a multidimensional historical context, requiring a framework of representations of the society and the individual to be formed. It is by means of the education given to new generations that these acquire cultural values and reproduce or transform the social codes. [14,15]

In the health area, the need for professional upgrading is constant and it is increasingly more evident that the current educational system is not managing to meet the social demands. [5,14] In fact, there is an international consensus indicating the need for changes in the healthcare professionals' education in view

of the inadequacy of the higher-education institutions in forming professionals adjusted to the labour market. [5]

Despite the relevance that this study can provide to encourage the application of new teaching methodologies, it is important to note that it has some limitations: 1. Researchers and participants were part of the same institution. In an attempt to avoid any influence on the participant, the researchers only had access to the answers without knowing who had responded. 2. Most participants lacked any knowledge about the PM, what might hamper the development of the activities proposed, but despite this, the majority of the participants considered them involved with a good performance in the application of PM.

The majority of the participants (96%) (Table 1) in this study believe that they took part in the development of the activities in a profitable way, reporting that the problematization methodology, MA was found to be adequate, stimulating, innovative, and facilitating, which enabled the inter-relationship between students and professor as well as between theory and practice. This finding was similar to others studies. [16,17] In the study done by Vargas [10]

**Table 3** - Evaluation of the professor's role according to the participant's view

EVALUATION OF THE PROFESSOR'S ROLE	YES	NO
Are the PM objectives coherent with those of your future teaching formation?	96%	4%
Can you realise the importance of the problematizing strategy for your formation as professor?	100%	0%
Can PM be used in the new teaching profile required for the professor?	100%	0%
Does PM favour effective participation of students and professors in the process of learning and teaching on a mutual basis?	100%	0%
In terms of professor-student relationship, does PM facilitate, promote and set up this interaction more than the so-called traditional (passive) methodologies?	96%	4%
Does PM allow constant and progressive contact with the professional and dental realities?	100%	0%
Do you believe that group activities for studying and planning academic and professional activities are more productive and provide knowledge consolidation?	92%	8%
Are professors prepared for interdisciplinary teamwork as stated by the PM?	56%	44%
Would the current professors be inclined to review their pedagogical practices?	68%	32%

Source: Questionnaire completed by the participants in the study.

the acceptance of Methodology was unanimous, seeing it as a facilitator in the teacher-student relationship and the process of learning, shown that students are open to learning and reflexive critic, so was observed in this study. There is a variety of techniques leading to a solution of the problems as follows: method of problems, technique of problems, solution of problems, case study, problem-based learning, method of projects, PM based on Maguerz's Arch and others. The use of these active methodologies to form healthcare professionals would be aimed at developing their teamwork ability to solve problems in a world in constant changes. Differently from the traditional methodology, there is the need to first find a problem belonging to the reality of the student's area, [18] with the learning being an active and constant process that leads the student to go beyond. [19]

In the PM, the students are gradually involved as they are often elaborating the problem. This gradual involvement increases depending on the study objective and until the student takes an action corresponding to the thoughts generated by the study, thus making the student an investigator. [8]

However, a few students (4%) (Table 1) reported that they did not feel encouraged to seek new references, that practice was not stimulating, and that the professor gives a class "without content". These findings are similar to other study. [20]

Another criticism regarding the problematization methodology application is the way the knowledge learned by the students was assessed. For the majority, methods such as seminars and debates seem to be invalid for assessing the student's degree of teaching and learning, believing that the professor can evaluate each student individually. However, part of the students think that the professor cannot precisely know what the student has studied if no theoretical exam is done, agreeing with other studies, [16,21] where part of the students questioned the credibility of the

learning due to the lack of traditional evaluation evidence, and reported lack of confidence in guiding their own learning and performing their self-evaluation, also showing a preoccupation with the lack of clarification on knowledge acquisition. Considering that these findings are related to lack of confidence regarding a novel learning approach, one cannot say that the methodology is not efficient at all.

Nevertheless, as reported by other studies, [17,22-26] despite the faults that may be found in this methodology, it is an innovative response to overcome the still-existing problems in the areas of health and education, thus being one more instrument for building knowledge. With changes being imposed by the contemporary world, one can note that the traditional teaching – based on knowledge convey, content importance, teacher's experience and methodology – has been insufficient to face the reality of the current society. [8,15] It is very unlikely that this situation will be solved with linear, defined and already elaborated solutions. Nowadays, the professional is supposed to have reasoning ability, make decisions, solve problems, be flexible, and have different views. Therefore, the today's educators are required to have new objectives, skills, and capacity to perceive changes. [8,11]

It is urgent and important to help the faculty members become apt to overcome the difficulties inherent to higher-education professors regarding their role of forming and conveying knowledge, thus contributing to the labour market insertion of dentists who are aware of the reality and capable of performing their work.

As observed [27] that the problematization-based methodologies have shown to be viable and important teaching strategies, but they cannot replace the traditional methodology completely. This conceptualisation is in accordance with the results found in this study, when was observed that the PM based on Marguerz's Arch should not be used as a unique teaching method, but a

complementary one in which there is no conflict and dispute between the didactic-pedagogical approach and the traditional teaching method. Mohamed [28] observed that students are mostly able to make use of different teaching methods in their learning process, being important that students and teachers are willing to make use of different methods in an attempt to optimize the process of teaching and learning.

Based on the results found, despite the majority of the students believing in the professors' capacity in performing interdisciplinary works and welcoming pedagogical changes, was found that many participants (44%) (Table 3) do not believe that professors are prepared for interdisciplinary work. Many also do not believe (32%) (Tables 3) that professors are actually willing to change their pedagogical methods, which is of concern as these are indeed necessary. Several authors [12, 29-31] also support this approach by stating that in view of the current society's needs, changes are crucial for an adequate formation of the future professionals. Jacobs [32] noted that it is possible a change in the conception of the professors in their way of teaching. However, this change does not happen quickly, the professor needs to gain confidence in the new methodology, a situation that only happens through positive experiences in applying it.

It is clear that no curricular theory is infallible, but it is important that the professor is open to new possibilities and has interest in improving the learning experience by recognising the importance of the student in this process and by accepting that it is also possible to learn new and innovative perspectives with the students rather than only teaching them. [32-34] Also importantly, according to the students, professors should know which are the positive and negative aspects in their way of teaching so that a more efficient teaching milieu can be provided. [35]

Education serves the interest of a society and, as such, one can state that the work of the

professor is predefined out of the school, where the way of teaching and what is taught are within social principles. With the expansion of the trade market and other achievements, the human work began to be measured by productivity. This notion has been still used in the today's one-way pedagogy, which does not challenge the student with relevant issues and makes education trivial as the traditional oral exposition is predominant and curricula are loaded, thus leaving no time for study and only allowing ready and finished content to be conveyed. [4]

The higher-education institutions should know and be aware of the importance of the professor in the teaching-learning process, and for the professor should be given good work conditions, qualification courses, and the possibility of teaching the student to think and of forming citizens who question the reality and seek good solutions, allowing new active teaching-learning strategies. [4]

A series of changes and improvements are needed, so that this modernisation of the teaching process can be conducted adequately and population benefited. Among these changes, one can suggest the increase in the number of professors and a better formation and utilisation of them, since they are responsible for the formation of future professionals who will be in direct contact with the population. [36] It is important to remember that in dentistry the professors often do not limit themselves to stay within the classroom only, since they also need to work with students and patients in the clinic units, which requires different competencies in order to have a good performance on both teaching front, [35] and the use of problematization in practice activities, allows overcoming the illustrative character of which was broadcast on the theory. [33]

## CONCLUSIONS

From the results analysed and with the limitations of this study it is possible to state that the problematization methodology, based on the



Marguerez's Arch is an innovative method of didactic-pedagogical approach in the formation of post-graduate students. However, one can also state that there is no unique superior methodology, since different methodologies complement themselves into adequate approaches in the teaching-learning process.

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Date submitted: 2014 Aug 19

Accept submission: 2014 Jan 20